

Application No.: 10/065,103

Docket No.: JCLA9142

REMARKS**I. Present Status of the Application**

The Office Action objected the drawings on grounds of failing to comply with 37 CFR 1.84(p)(5). The Office Action rejected claims 1, 12 and 14-16 under 35 U.S.C. § 102(e) as being anticipated by Dalal et al. (US 6,344,234).

Upon entry of the amendments in this response, the specification and claims 1 and 14-16 are amended; claim 12 is canceled without prejudice. Hence, claims 1 and 14-16 are now pending in the present application, with claim 1 being independent claim. Claim 1 has been amended by incorporating a limitation from the original claim 12, and claim 12 is thus canceled. Claims 14-16 are amended for matter of form. Applicants believe that the foregoing amendments do not introduce new matter. Thus, reconsideration of those claims is respectfully requested.

Application No.: 10/065,103

Docket No.: JCLA9142

II. Response to Objections and Rejections

A. Objections to the drawings

The Office Action, at page 2, item 4, objected the drawings on grounds of failing to comply with 37 CFR 1.84(p)(5). The Examiner states that the reference signs 412 and 414 are not mentioned in the description. The Examiner requests Applicants to amend the specification to add the reference signs in the description. In accordance with the Examiner's request, Applicants have amended the specification. Accordingly, Applicants respectfully submit that the objection has been overcome and should be withdrawn.

B. Rejections under 35 U.S.C. § 102(e)

The Office Action, at page 3, items 6-11, rejected claims 1, 12 and 14-16 under 35 U.S.C. § 102(e) as being anticipated by Dalal et al. Applicants respectfully traverse the rejection as it applies to the amended claims for at least the reasons set forth below.

To anticipate a claim, the prior art reference must teach each and every element of the claim. M.P.E.P. § 2131.

The independent claim 1, as amended, recites as follows.

1. An under-bump metallurgical structure between the bonding pad of a die and a solder bump made from a lead-tin alloy or a lead-free alloy, comprising:
 - a metallic layer over the bonding pad; and
 - a mini bump between the metallic layer and the solder bump for reducing the growth of inter-metallic compound between the metallic layer and the solder bump.

Application No.: 10/065,103

Docket No.: JCLA9142

(Emphases added). Apparently, the claimed invention provides a mini bump between the metallic layer and the solder bump, and the mini bump is for reducing the growth of inter-metallic compound between the metallic layer and the solder bump.

Dalal et al., however, are directed to a solder ball with “a cap of low melting point metal” (column 6, lines 34-39; Fig. 6), in other words, “a layer of low melting point metal . . . is deposited on the top of the solder balls” (abstract). Dalal et al. teach that their invention “is designed to lower the melting point only at the tip of the solder interconnection height” (column 4, lines 16-10). Dalal et al. further disclose that “[a]s can be clearly seen in FIG.6, that the solder ball 18, has a coating of tin 23, over only a portion of its upper surface” (column 7, lines 15-17), and that “it is preferred that the thickness of the low melting point metal cap . . . provides a eutectic volume of between about 5 percent to about 30 percent of the volume of the solder ball 18, and preferably between about 10 percent to about 20 percent of the volume of the solder ball 18” (column 7, lines 35-43). (Emphases added).

Apparently, a person of ordinary skill in the field of the invention would consider that Dalal et al.’s solder ball with a low melting point metal cap is different from the claimed solder ball with a mini bump thereunder; unlike the claimed invention, Dalal et al.’s solder ball has no buffer metallic structure or mini bump thereunder. It is noted that the Examiner compares Dalal et al.’s solder ball (18) to the claimed buffer metallic structure (mini bump), and the Dalal et al.’s metal cap (23) to the claimed solder bump. Applicants respectfully submit that, even if such a comparison is made, the foregoing structures are still patentably different for at least that Dalal et

Application No.: 10/065,103

Docket No.: JCLA9142

al.'s metal cap is only a small portion "on the tip of" the base solder ball, while the claimed solder ball covers a small "mini bump" thereunder. Moreover, Dalal et al. do not teach the function of "reducing the growth of inter-metallic compound between the metallic layer and the solder bump" as recited in claim 1.

Therefore, Dalal et al. do not anticipate claim 1, as amended, since Dalal et al. do not disclose each and every element of the claims. Consequently, Dalal et al. do not anticipate claims 14-16 dependent on claim 1, as a matter of law.

For at least the foregoing reasons, Applicants respectfully submit that the grounds of rejection have been addressed and the rejection has been overcome. Reconsideration and withdrawal of the rejection are respectfully requested.

Application No.: 10/065,103

Docket No.: JCLA9142

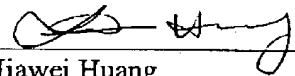
CONCLUSION

For at least the foregoing reasons, it is believed that the pending claims 1 and 14-16 are in proper condition for allowance. If the Examiner believes that a telephone conference would expedite the examination of the above-identified patent application, the Examiner is invited to call the undersigned.

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4 Venture, Suite 250
Irvine, CA 92618
Tel.: (949) 660-0761
Fax: (949) 660-0809

Respectfully submitted,
J.C. PATENTS


Jiawei Huang
Registration No. 43,330